

WHAT IS CLAIMED IS:

1. A method of treating insulin resistance or hypoinsulinemia in mammals comprising administering to a mammal in need thereof an effective amount of an antagonist to Dickkopf-1 (Dkk-1).
2. The method of claim 1 wherein the mammal has non-insulin dependent diabetes mellitus (NIDDM).
3. The method of claim 1 wherein the mammal is human and the antagonist is to human Dkk-1.
4. The method of claim 1 wherein the antagonist is an antibody that binds Dkk-1.
5. The method of claim 4 wherein the antibody is a monoclonal antibody.
6. The method of claim 5 wherein the antibody is prepared from a hybridoma having ATCC Dep. No. PTA-3086.
7. The method of claim 1 wherein the administration is systemic.
8. The method of claim 1 wherein insulin resistance is treated, further comprising administering an effective amount of an insulin-resistance-treating agent to the mammal.
9. The method of claim 1 wherein hypoinsulinemia is treated, further comprising administering an effective amount of insulin to the mammal.
10. A method for detecting the presence or onset of insulin resistance or hypoinsulinemia in a mammal comprising the steps of:
  - (a) measuring the amount of Dickkopf-1 (Dkk-1) in a sample from said mammal; and
  - (b) comparing the amount determined in step (a) to an amount of Dkk-1 present in a standard sample, an increased level in the amount of Dkk-1 in step (a) being indicative of insulin resistance or hypoinsulinemia.
11. The method of claim 10 wherein the measuring is carried out using an anti-Dkk-1 antibody in an immunoassay.
12. The method of claim 11 wherein the anti-Dkk-1 antibody comprises a label.
13. The method of claim 12 wherein the label is selected from the group consisting of a fluorescent label, a radioactive label, and an enzyme label.
14. The method of claim 11, wherein the immunoassay is selected from the group consisting of a radioimmunoassay, an enzyme immunoassay, an enzyme-linked immunosorbent assay, a sandwich immunoassay, a precipitation assay, an immunoradioactive assay, a fluorescence immunoassay, a protein A immunoassay, and an immunoelectrophoresis assay.
15. The method of claim 10 wherein the insulin resistance is non-insulin dependent diabetes mellitus.
16. The method of claim 10 wherein the mammal is human and human Dkk-1 is being measured.
17. A kit for treating insulin resistance or hypoinsulinemia, said kit comprising:
  - (a) a container comprising an antagonist to Dkk-1; and
  - (b) instructions for using the antagonist to treat insulin resistance or hypoinsulinemia.
18. The kit of claim 17 wherein the antagonist is an antibody that binds Dkk-1.
19. The kit of claim 18 wherein the antibody is a monoclonal antibody.
20. The kit of claim 18 wherein the antibody binds human Dkk-1.
21. The kit of claim 17 for treating non-insulin dependent diabetes.

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22. The kit of claim 17 further comprising a container comprising an insulin-resistance-treating agent if insulin resistance is treated or insulin if hypoinsulinemia is treated.
23. A hybridoma selected from the group consisting of ATCC Dep. No. PTA-3084, PTA-3085, PTA-3086, PTA-3087, PTA-3088, PTA-3089, and PTA-3097.
24. The hybridoma of claim 23 that is ATCC Dep. No. PTA-3086.
25. An antibody prepared from the hybridoma of claim 23.
26. A method of treating obesity or hyperinsulinemia in mammals comprising administering to a mammal in need thereof an effective amount of Dickkopf-1 (Dkk-1).
27. The method of claim 26 wherein the mammal is human and the Dkk-1 is human Dkk-1.
28. The method of claim 26 wherein the administration is systemic.
29. The method of claim 26 further comprising administering an effective amount of weight-loss agent.
30. A method for detecting the presence or onset of obesity or hyperinsulinemia in a mammal comprising the steps of:
  - (a) measuring the amount of Dickkopf-1 (Dkk-1) in a sample from said mammal; and
  - (b) comparing the amount determined in step (a) to an amount of Dkk-1 present in a standard sample, a decreased level in the amount of Dkk-1 in step (a) being indicative of obesity or hyperinsulinemia.
31. The method of claim 30 wherein the measuring is carried out using an anti-Dkk-1 antibody in an immunoassay.
32. The method of claim 31 wherein the anti-Dkk-1 antibody comprises a label.
33. The method of claim 32 wherein the label is selected from the group consisting of a fluorescent label, a radioactive label, and an enzyme label.
34. The method of claim 31, wherein the immunoassay is selected from the group consisting of a radioimmunoassay, an enzyme immunoassay, an enzyme-linked immunosorbent assay, a sandwich immunoassay, a precipitation assay, an immunoradioactive assay, a fluorescence immunoassay, a protein A immunoassay, and an immunoelectrophoresis assay.
35. The method of claim 30 wherein the mammal is human and human Dkk-1 is being measured.
36. A kit for treating obesity or hyperinsulinemia, said kit comprising:
  - (a) a container comprising Dkk-1; and
  - (b) instructions for using the Dkk-1 to treat obesity or hyperinsulinemia.
37. The kit of claim 36 wherein the Dkk-1 is human Dkk-1.
38. The kit of claim 36 further comprising a container comprising a weight-loss agent if obesity is being treated or comprising diazoxide if hyperinsulinemia is being treated.
39. A diagnostic kit for detecting the presence or onset of insulin resistance, hyperinsulinemia, hypoinsulinemia, or obesity, said kit comprising:
  - (a) a container comprising an antibody that binds Dickkopf-1 (Dkk-1);
  - (b) a container comprising a standard sample containing Dkk-1; and
  - (c) instructions for using the antibody and standard sample to detect insulin resistance, hyperinsulinemia, hypoinsulinemia, or obesity, wherein either the antibody that binds Dkk-1 is

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- detectably labeled or the kit further comprises another container comprising a second antibody that is detectably labeled and binds to the Dkk-1 or to the antibody that binds Dkk-1.
40. The kit of claim 39 wherein the antibody that binds Dkk-1 is a monoclonal antibody.
  41. The kit of claim 39 wherein the Dkk-1 is human Dkk-1 and the kit is for detecting non-insulin dependent diabetes or obesity.
  42. A method for repairing or regenerating muscle in a mammal comprising administering to the mammal an effective amount of an antagonist to Dkk-1.
  43. The method of claim 42 wherein the antagonist is an antibody that binds Dkk-1.
  44. The method of claim 43 wherein the mammal is human and the antibody binds human Dkk-1.
  45. The method of claim 42 wherein the antibody is a monoclonal antibody.
  46. A kit for repairing or regeneration muscle, said kit comprising:
    - (a) a container comprising an antagonist to Dkk-1; and
    - (b) instructions for using the antagonist to repair or regenerate muscle in a mammal.
  47. A monoclonal antibody preparation prepared by hyperimmunizing mice with tagged Dkk-1 diluted in an adjuvant, fusing B-cells from the mice having anti-Dkk-1 antibody titers with mouse myeloma cells and obtaining supernatants, harvesting the supernatants, screening the harvested supernatants for antibody production, injecting positive clones showing the highest immunobinding after a second round of subcloning into primed mice for *in vivo* production of monoclonal antibodies, pooling ascites fluids from the mice, and purifying the ascites fluid pool to produce the antibody preparation.
  48. A method of evaluating the effect of a candidate pharmaceutical drug on insulin resistance, hypoinsulinemia, or muscle repair comprising administering said drug to a non-human transgenic animal that overexpresses *dkk-1* nucleic acid and determining the effect of the drug on glucose clearance from the blood of said animal, on circulating insulin levels in said animal, or on muscle differentiation, respectively.
  49. A method of evaluating the effect of a candidate pharmaceutical drug on obesity or hyperinsulinemia comprising administering said drug to a non-human binary transgenic animal that expresses *dkk-1* nucleic acid and determining the effect of the drug on an obesity-determining property or on the level of insulin in said animal.
  50. A non-human transgenic animal that overexpresses *dkk-1* nucleic acid.
  51. The animal of claim 50 that is a rodent.
  52. The animal of claim 50 that is a mouse.